

THE RESULTS OF OPERATIONS FOR CHRONIC APPENDICITIS: A STUDY OF 555 CASES.¹

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THIS study is based on two questions: (1) How often does the removal of a supposedly diseased appendix fail to relieve symptoms or improve the patient's condition and (2) what are the reasons of such failures and how can we avoid them?

Removal of the appendix is very common today. The great bulk of these operations is very easy and can be readily done even by those with little technical skill and a minimum knowledge of surgical principles and morbid anatomy. The immediate convalescence is easy and the psychic results are also a factor. The operation is particularly gratifying as a prophylactic measure when well-defined attacks have given anxiety lest the subject should be "caught" in the more serious or even tragic phases of an acute attack.

In a second class the removal of the appendix brings relief to symptoms which are indirect, particularly of the digestive apparatus. According to Moynihan's dictum, most of the ulcers of the stomach are situated in the right iliac fossa.

Both of the above classes furnish a legitimate and gratifying field, and if operations were limited to them there would be but few failures to record. Operations for chronic appendicitis have also given good results in that the operation, if conducted as an exploratory operation (as it should generally be), has resulted in removing an appendix, normal or altered, and in remedying at the same time some other important morbid process.

Unfortunately the second class is not sharply defined, and there is also a third and rather vague class—which might be called the symptomless class—in which the removal of the appendix has apparently greatly benefited the patient's general condition.

Owing to the vagueness of this third class, numerous patients are subjected to removal of the appendix needlessly and recklessly. Consequently a certain proportion of bad results must follow to the natural dissatisfaction of the patient, often to his great detriment, if a condition really needing surgical interference (*e. g.*, ureteral stone) was overlooked, and to the discredit of the profession. Witness the laws of a Western State which inflicts penalties for needless appendix operations.

An incorrigible humorist, the late Dr. Alexander Johnson, once answered a layman's inquiry as to the functions of the appendix

¹ Read before the New York Academy of Medicine, January 15, 1929.

by saying: "It contributes largely to the support of a noble profession." Many a truth is spoken in jest, but I dislike to think of our profession being either the principal or accessory to such a joke, and in this paper I hope to demonstrate what we have done in our hospital service toward lessening the opportunities for such jibes.

The thoughtful and conscientious element of the profession has for some time recognized that appendix operations not infrequently give bad results; but there has not been enough frank confession of these results or systematic attempts to obtain a remedy. It is natural and legitimate to err on the side of safety, and it is a fearful thing to tell a patient he has no reason to worry over his appendix and have the patient subsequently go through a severe acute operation or possibly die. Perhaps it will be better to resign ourselves to doing a certain number of these needless operations for the sake of safety. I believe we can reduce them by more painstaking methods of study of such conditions, particularly of the more common sources of error.

One great help is the study of results. Soon after the establishment of my follow-up system² in my service at the New York Hospital, in 1914, it became painfully evident that we were getting too many unfavorable reports in our chronic appendicitis cases, and measures were instituted along the lines to be described later for this improvement. The preparation of a formal study of a large number of conditions was delayed by war conditions, and it was not until this paper was undertaken that the full significance of many of the features necessary for improvement was realized.

Table I shows that of late our results have been much better. Also the greater degree of exploration we are now making by abandoning the small or interval incisions. We are also doing either fewer operations for chronic appendicitis or operating on cases under a different and correct diagnosis.

TABLE I.

Year.	No. of cases.	Per cent. unsatisfactory.	Per cent. of McBurney incisions.
1913	70	28	74
1914 ²	63	23	65
1915	98	28	21
1916	100	26	36
1917	119	24	35
1918	84	20	14
1919 (6 months)	21	11	10

This paper is based on a study of 555 patients in the ward (no private) service of the First Surgical Division of the New York

² *Annals of Surgery*, September, 1910, No. 3, vol. lxi; December, 1919, No. 6, vol. lxx.

³ After my follow-up system had been in effect a year the McBurney incisions dropped notably.

Hospital, January 1, 1913, to July 1, 1919. Of this number we have no record of 126 patients.⁴ We have good reasons, to be stated later, for believing that our best results were obtained in the patients who failed to report, consequently the basing of end-results on only the 426, restricting the reported number, makes the results seem worse than they really are.

We have preferred to take the facts as they appear in our records rather than yield to the temptation of juggling of figures in any way. Several of our cases are obviously not cases of chronic appendicitis, the main operation being something else, but the discharge cards read (as a result of carelessness) "Chronic appendicitis," and are so recorded. (The service was kept going with great difficulty during the war.) The work has been done by myself, the two associate surgeons, Drs. J. M. Hitzrot and B. J. Lee; Dr. C. E. Farr, assistant surgeon, and, for a short period, by Dr. L. A. Wing.

For the sake of clearness the cases have been divided into five categories:

Class A (259). *Excellent*. Patients who on reëxamination present no complaints whatsoever.

Class B (65). *Satisfactory*. No complaints pointing to their former condition, but have some minor complaint.

Class C (102). *Unsatisfactory*. Patients who have not been improved.

Class D (126). *Unknown*.

Class E (3). *Deaths*.

All classes have been studied under the same headings. Table II gives a summary of the principal findings common to all classes.

We note that the age distribution seems to be about the same in all classes, the largest percentage of operations being performed on patients between the ages of twenty and thirty. It will be noted also that the unsatisfactory cases were the ones averaging the longest stay in the hospital. This fact probably means that their cases were obscure and reluctance was felt to operate on them without sufficient observation.

Under "Special Examinations" we mean more particularly gastric analyses and bismuth series of the gastro-intestinal tract. There is not much difference in any of these classes, the lowest being the unknown, occurring largely in our first year before we had systematized our hospital service.

By "Further Exploration" is meant that a record exists in the history of the operation that investigations of the abdomen were made besides the removal of the appendix. Considerably less of this exploration apparently was made in the classes "Satisfactory" and "Unknown," probably owing to the very obvious pathological

⁴ Many of these are 1913 patients who could not be traced after a period longer than the usual three months.

condition of the appendix as noted in the percentage of those conditions found.

TABLE II.

	Excellent, per cent.	Satisfactory, per cent.	Unsatisfac- tory, per cent.	Unknown, per cent.
Male ³	70	14	16	
Female	56	16	28	
Nationality (English speaking) . .	43	49	29	38
Age:				
1 to 10 years	1	2	2	2
10 to 20 "	29	23	27	22
20 to 30 "	46	56	48	52
30 to 40 "	17	12	15	20
40 to 50 "	5	3	4	2
50 to 60 "	2	2	1	2
60 to 70 " . . . . .	..	2	3	
History of well-defined attacks . .	51	51	35	47
Analysis of chief symptoms:				
Pain, R. L. Q.	50	35	30	50
Pain and vomiting	15	15	13	16
Pain in epigastrium	7	5	9	6
Pain and constipation	9	25	8	5
Average number of days spent in hospital before operation	2.57	2.53	3.19	2.30
Special examinations	46 ⁴	54	56	36
Kind of incision:				
McBurney	37	22	31	52
Largo	63	78	69	48
Appendix pathological	85	75	63	77
Further exploration	52	83	73	52
Complications	22	38	22	18
Subsequent admission	2	0	25	2
Subsequent operation	1.5	..	5	2

By "Complications" we mean the existence or remedying of other conditions whether intra-abdominal or not.

³ The percentage of satisfactory cases was 72 per cent. for women, 88 per cent. for men.

⁴ Diagnosis more obvious in lesser number of tests. Notes have all been more precise in the more recent years since we have learned the necessity of precision of data.

POINTS OF SPECIAL INTEREST IN EACH CLASS.

Class A. Excellent, 259.

The larger proportion of males. Men have fewer conditions to obscure the diagnosis. There are more men carrying a really diseased appendix. Of our 820 operations for *acute* appendicitis 64 per cent. were men.

Larger proportion, as in Class B, of English-speaking people (who are in a minority in the New York Hospital). As the greatest single factor in diagnosis is a clear and reliable history we are much handicapped by the limitations of speech and intelligence of our patients. The larger proportion of histories giving definite pain, 50 per cent., in the right lower quadrant.

Definite record of the removal of an obviously pathological appendix, 85 per cent., compared to the 63 per cent. in the unsatisfactory Class C. These findings are dictated in the operating room in the hearing of the assistants and onlookers.

Only 2 per cent. of these patients were readmitted (for other conditions), while 25 per cent. of unsatisfactory, Class C, came back.

Class B. Satisfactory, 65.

Class B shows substantially the same features, but is less marked as regards the three main features, per centage of males, pathological appendix and pain in R. L. Q. It is in this class of cases that we may have occasionally overlooked some cause for their minor complaints.

ANALYSIS OF POSTOPERATIVE COMPLAINTS.

Complaint.	No. of cases.
Constipation	29
Gynecological conditions	6
Pain elsewhere	3
Backache	4
Bladder trouble	2
Pain in scar	4
Indigestion	6
Vague complaints	11

Of the group classed as satisfactory, but exhibiting minor complaints, we note the largest (with the exception of constipation), 11 cases, as absolutely vague, such as "having a burning sensation when she wears corsets." Six are gynecological troubles, such as leucorrhoea and lacerated cervix. A little pain in scar or slight indigestion make up the next largest groups.

Class C. Unsatisfactory, 102.

This is the class which is really the subject of the paper and deserves the fullest analysis. All reasonable efforts were made to have the patients subject themselves to more examinations, particularly those bearing on symptoms complained of, *e. g.*, gastric analyses and roentgen ray for gastro-intestinal conditions, also

roentgen ray of the urinary tract. Twenty-five per cent. were persuaded to reënter the hospital for observation. The results are shown in Table III.

TABLE III.—SUBSEQUENT ADMISSIONS AND OPERATIONS, 26.

Gastropotosis, 3 cases. All cases had gastric analysis and bismuth series.

Neurasthenia and rheumatism, 1 case.

Postoperative constipation, 1 case. Gastric analysis.

Readmitted for bismuth series, negative result, 4 cases.

Adhesions of peritoneum, no operation, 5 cases.

Five cases had bismuth series. Negative, with exception of one case, which showed possibly slight gastropotosis.

Adhesions of peritoneum, operation, 3 cases.

1. Operation showed adhesion of omentum to sear. Adhesion divided. Six months after second operation patient still complained of indefinite pain on the right and the left side of the abdomen.

2. Operation showed adhesions of the peritoneum and abscess of the colon. Nine months after this operation the patient was again admitted, with diagnosis of adhesions. Operation thought inadvisable.

3. Two operations for adhesions. First fourteen months after appendectomy, second a year and seven months later. Readmitted a third time, with same diagnosis, but operation was thought inadvisable.

Removal of cystoma of right ovary, 1 case. "Neurasthenic wreck."

Cholecystectomy for cholelithiasis, 1 case. Six months after this second operation the patient came back, complaining of symptoms which point to adhesions.

Roentgen ray of sacro-iliac joint suspicious of arthritis, 1 case.

Roentgen ray of kidney negative, 3 cases.

Possible ulcer of stomach, 2 cases.

Bismuth series and gastric analysis.

Readmitted for investigation, diagnosis unknown, 1 case. Gastric analysis.

This series of readmission cases (the severer) showed therefore:

Four cases of gastropotosis (3 cases had pathological appendix).

Four presumptive postoperative adhesions.

One cholelithiasis.

One cystoma of ovary.

Three definite trouble from adhesions as proved by operation

We may say, therefore, that mistakes were made in not looking for or missing the cholelithiasis and the ovarian cyst, and that it was probably a mistake to have operated at all on the cases of gastropotosis.

It is impossible to judge whether adhesions are due to original conditions or to the appendectomy. Turning in of the stump of the appendix, as is our custom, leaves a minimum of irritation, but I have seen severe adhesions following.

In patient's not reëntering the hospital further study and examinations were unsatisfactory. Many flatly refused any form of examination, particularly those subjecting them to discomfort and loss of time. Expense was also a drawback, as these patients are required to pay for their roentgenray examination. As a consequence we are quite often unable to get an intelligent impression of the results, particularly in distinguishing ordinary kicks and neurotic manifestations.

Table IV shows the grouping of complaints, with data as to sex and condition of appendix:

TABLE IV.

Unsatisfactory (chief complaint after operation).	Male.	Condition of appendix.		Female.	Condition of appendix.	
		Path.	Not path.		Path.	Not path.
Pain in region of gall-bladder	1	...	1	2	2	
Pain over right kidney . . . . .	...	...	...	2	1	1
Diarrhea	1	...	1			
Pain in epigastrium	4	3	1	3	2	1
Great many vague pains and symptoms	5	4	1	16	8	8
Dilatation of recti . . . . .	...	...	...	1	...	1
Severe pain just below umbilicus	1	1				
Wound still discharging	1	...	1			
Severe pain in right side, especially during menstrual period . . . . .	...	...	...	3	3	
Pain in appendix region	1	1	...	19	14	5
Pain in right lumbar region and discomfort about scar . . . . .	...	...	...	1	1	
Abdominal pain and cramps	1	...	1	6	3	3
Pain both sides of abdomen . . . . .	...	...	...	1	1	
Pain in region of splenic flexure . . . . .	...	...	...	1	...	1
Feels sick, loss of weight, appetite poor and bowels bad . . . . .	...	...	...	1	...	1
Pain on left side, headache, poor appetite . . . . .	...	...	...	1	1	
Nausea and loss of weight . . . . .	...	...	...	1	...	1
Constipation, poor appetite, pain in scar . . . . .	...	...	...	1	1	
Indigestion, obstinate constipation, pain in back . . . . .	...	...	...	1	1	
Constipation, headache, vomiting . . . . .	...	...	...	1	...	1
Great deal of tenderness in scar . . . . .	...	...	...	1	1	
Cramps at night, loss of sleep, loss of weight . . . . .	...	...	...	1	1	
Gas and soreness, R. L. Q.	1	1				
Great deal of pain in right groin . . . . .	...	...	...	1	1	
Same pain as before operation	8	5	4	12	9	3
Pain and discomfort in lower right abdomen . . . . .	...	...	...	2	1	1

Analysis of chief complaint after operation shows pain in some form as the main factor. It comes mainly under four headings:

1. Great many vague pains and symptoms, seen mostly in women (16), 21 cases.
2. Pain in appendix region (19 women, 1 man), 20 cases.
3. Same pain as before operation (8 men, 12 women), 20 cases.
 - (a) Pain in epigastrium, 1 case.
 - (b) Abdominal pain, 2 cases.
 - (c) Pain in right inguinal region, 1 case.
 - (d) Discomfort in lower abdomen, 1 case.
 - (e) Pain in right iliac region, 1 case.
 - (f) Indigestion and gas, 1 case.
 - (g) Pain in R. L. Q., 13 cases.
4. Pain in epigastrium (4 men, 3 women) 7 cases.

Of the 65 cases in which the appendix was obviously pathological, 66 per cent. had further exploration at the time of the operation.

Of the 37 cases in which the appendix was not obviously pathological, 84 per cent. had further exploration at the time of the operation.

In group 1 and 2 it is legitimate to believe that most of these were unjustified complaints, for the sake of making a "kick" or "nerves."

In groups 3 and 4 it is more likely that the real cause was overlooked. These two classes showed a clean-cut preponderance of definitely pathological appendices, hence the operator probably did not make so thorough a search for a coexistent lesion as he would have felt it necessary to make if he had found originally an innocent-looking appendix.

In this class exploration of the abdomen showed a number of conditions which were remedied, some non-remediable by operation, and in a smaller group it is not obvious if any attempt was made to remedy the trouble. In 40 cases exploration was negative. Most of the troubles were gynecological or due to adhesions. On the whole one gets the impression that the explorations were thorough and the conditions found generally satisfactorily remedied, so that the poor results in this group were not due to careless or insufficient operation.

How shall we explain the results in this group in which in the majority (63 per cent.) the appendix is stated to be definitely pathological? I think it is fair to say that in a certain number there were in addition to a true appendix other conditions which we overlooked, lulled into a false security by the fact that there was a definitely pathological appendix and therefore did not make the operation a true exploratory laparotomy with a large incision allowing of a more nearly complete examination, particularly of the upper abdomen. The frequent coexistence of disease of the upper abdomen with a chronic appendicitis is today well established. Every surgeon of large experience can relate coexistence of a certain number of cases

of acute appendicitis, with other conditions which give rise to the "acute abdomen." Offhand I can remember two acute appendices coexistent with ruptured ectopic, also coincident with a torsion of an ovarian cyst, also a recent acute appendix, with a subacute perforation of the duodenum. The lesson, therefore, is to do more thorough work, even if a definitely chronic appendix is found, look for other possible lesions, particularly in women and those past the second decade, and more particularly the third. At an earlier period gastro-intestinal conditions, biliary lesions, diseases of the pelvic viscera, especially the sequelae of pregnancy, are rare.

We do not have to be too apologetic for the results of Class C (unsatisfactory cases); that 63 per cent. of them were safely and on the whole comfortably rid of a definitely bad appendix is by no means a surgical failure.

Class D. Unknown, 126.

This class would probably represent the most satisfactory cases, as it corresponds largely to the conditions noted in "Class A," or Excellent, the large proportion of males, history of well-defined attacks, pain in the right lower quadrant and obviously pathological appendix. A large proportion of these patients were operated on in 1913, but were not sent for until a much later date, and therefore could not be traced.

Class E. Deaths, 3. The three deaths were due to:

1. Postoperative intestinal obstruction.
2. Acute general peritonitis and lobar pneumonia.
3. Cellulitis of abdominal wall, multiple intra-abdominal abscesses and pulmonary tuberculosis. The sepsis was the result of using unsterilized material at operation, due to the mistake of a green orderly.

A fourth death might be included technically in this series under chronic appendicitis. It is, however, such a faulty diagnosis that I feel justified in eliminating it. The patient entered the hospital and was operated on under the diagnosis of chronic appendicitis. Operation, March 7, 1916, the appendix could not be found. Re-entered the hospital June 8, 1916, for an operation for repair of a fecal fistula, the lesion at that time being diagnosed as tuberculosis of the intestines. November 2, 1917, he underwent another operation for the cure of the fecal fistula and ventral hernia, from which he died.

To avoid disappointing results after operations for chronic appendicitis I recommend:

1. A comprehensive and detailed history.
2. A complete and thorough physical examination, including all refinements of diagnosis.
3. Exercise caution in undertaking operation on women as compared to men.

4. Exercise caution, particularly in the more mature patients, particularly women. In this class other lesions may coexist or may be mistaken for appendicitis.

5. Avoid the neurasthenies of any age or sex.

6. Exercise particular restraint when there is no clear and reliable history of well-defined attacks, particularly of localized pain accompanied by nausea or vomiting.

7. Make a good-sized incision, and, even if a frankly pathological appendix is found, look for other possible lesions.

8. If no obviously pathological appendix is found, do not cease looking for other lesions until every other possibility has been exhausted; make a supplementary incision if necessary.

NOTE. In discussing this paper, Dr. C. H. Peek alluded to the possibilities of trouble due to adhesions possibly provoked by the irritating effects of tincture of iodine carried from the surgeon's gloves from the skin.

It suddenly occurred to me that the explanation of the very marked improvement in results for the six months ending July 1, 1919 (11 per cent. of unsatisfactory results as compared to 20 per cent. in the year 1918), might very well be due to the absence of this irritating property of iodine, as in December, 1918, we instituted in our service the use of 5 per cent. alcoholic solution of picric acid for the skin. We are very sure of the superiority of this method as regards irritation of the skin. Of nearly 1500 cases we have had only one that showed any irritation at all, and that extremely trivial. Experiments are now being conducted by Dr. Charles E. Farr, assistant surgeon, concerning the comparative irritation of picric acid on the peritoneum.

Should the presumption raised by this improvement in our figures be confirmed by further experiments, especially by others, a very notable improvement in operative technique would ensue. As noted before, the chief and very constant complaint of patients returning for observation who were not satisfied by their operation is pain, and it might well be pain due to the irritation of the iodine, as it is particularly noticeable that the pain so frequently mentioned is at the operative site, although an unquestionably pathological appendix has been removed.

It is also interesting to contrast the practical absence of complaints of our patients who have been operated on for acute appendicitis. When reexamined they are quite free from complaints. Of course, with an acute operation little or no exploration is usually made and only a very small field is exposed.